

Week 67 (12/22/03)

Inverted pendulum

A pendulum consists of a mass m at the end of a massless stick of length ℓ . The other end of the stick is made to oscillate vertically with a position given by $y(t) = A \cos(\omega t)$, where $A \ll \ell$. It turns out that if ω is large enough, and if the pendulum is initially nearly upside-down, then it will, surprisingly, *not* fall over as time goes by. Instead, it will (sort of) oscillate back and forth around the vertical position. Explain why the pendulum doesn't fall over, and find the frequency of the back and forth motion.